

IN THE CLAIMS:

The following listing of claims will replace all prior listings of claims in the application:

1. (Currently Amended): A Linear Complementarity Problem (LCP) solver, comprising:

a plurality of Island Processing Engines (IPEs), wherein each IPE receives an island data set including a collection of data matrices and further comprises a plurality of parallel execution units, and each IPE is configured to distribute a first portion of the island data set representing first constraint rows of the collection of data matrices between the plurality of the execution units, so that a first portion of the first constraint rows associated with a first common object of the island data set is distributed to a first execution unit and a second portion of the first constraint rows associated with a second common object of the island data set is distributed to a second execution unit;

wherein each one of the plurality of execution units resolves a data portion of the first constraint rows derived from the island data set in parallel and resolves a data portion of second constraint rows representing a portion of the collection of data matrices serially, the second constraint rows being associated with both the first common object and the second common object.
2. (Original): The LCP solver of claim 1, wherein at least one of the plurality of execution units comprises a vector processor.
3. (Original): The LCP solver of claim 1, wherein each IPE further comprising:

an IPE memory storing the island data set;

an Island Control Unit (ICU) logically controlling the transfer of data from the IPE memory to the plurality of execution units.

4. (Currently Amended): The LCP solver of claim 3 wherein ~~each execution unit further comprises:~~
- ~~an associated memory storing a respective first data portion of the first constraint rows resolved by a first execution unit of the plurality of execution units is transferred from the first execution unit to a second execution unit of the plurality of execution units through the IPE memory.~~
5. (Currently Amended): The LCP solver of claim 3 wherein each IPE further comprises:
- a Content Addressable Memory (CAM) operatively connected to the ICU, ~~such that by inter-operation of the ICU and CAM and configured to store an entry for the first common object and the second common objects defined in each respective data portion is derived from the island data set.~~
6. (Currently Amended): A system executing a main application and comprising:
- a Central Processing Unit (CPU), a main memory, and one or more peripherals including a display;
- wherein the main memory stores an initial data set related to a physics-based problem arising from execution of the main application, the initial data set including a collection of data matrices;
- the system further comprising a Linear Complementarity Problem (LCP) solver executing a projected iterative descent method adapted to resolve LCPs derived from the initial data set using a plurality of execution units arranged in parallel by distributing constraint rows of the data matrices that do not include a competing object pair to the plurality of execution units for processing in parallel and distributing constraint rows of the data matrices that do include a competing object pair to the plurality of execution

units for serial processing, wherein the data matrices represent movements of a rigid body object associated with the main application.

7. (Original): The system of claim 6, wherein each one of the plurality of execution units comprises a circuit executing floating point operations.
8. (Currently Amended): The system of claim 7, wherein the initial data set is divided into a plurality of island data sets; and
wherein the LCP solver further comprises:
a plurality of Island Processing Engines (IPEs), wherein each IPE comprises a portion of the plurality of parallel execution units and an IPE memory storing one of the plurality of island data sets.
9. (Original): The system of claim 8, wherein each IPE further comprises an Island Control Unit (ICU) controlling the transfer of data from the IPE memory to the plurality of execution units.
10. (Original): The system of claim 9, wherein each one of the plurality of execution units comprises a Vector Processing Unit (VPU) having an associated VPU memory.
11. (Currently Amended): The system of claim 10, wherein each IPE further comprises:
a Content Addressable Memory (CAM) operatively connected to the ICU and configured to store common object information for the constraint rows in order to identify competing object pairs[[,]] such that, by interoperation of the ICU and CAM, respective data portions are derived from the island data set and transferred to a corresponding VPU for resolution.
12. (Currently Amended): A system executing a main application and comprising:

a Central Processing Unit (CPU), a main memory associated with the CPU and one or more peripherals including a display;

wherein the main memory stores an initial data set including a collection of data matrices that is related to a physics-based problem arising from execution of the main application;

the system further comprising a Physics Processing Unit (PPU), the PPU comprising:

a PPU memory receiving and storing at least a portion of the initial data set, including a plurality of island data sets, each island data set corresponding to a rigid body island defined in the initial data set; and,

a Linear Complementarity Problem (LCP) solver executing a computational method adapted to resolve a plurality of LCPs, each LCP being derived from a corresponding island data set;

wherein the LCP solver comprises a plurality of execution units resolving the plurality of LCPs in parallel by distributing constraint rows of the data matrices that do not include a competing object pair to the plurality of execution units for processing in parallel and distributing constraint rows of the data matrices that do include a competing object pair to the plurality of execution units for serial processing.

13. (Currently Amended): The system of claim 12, wherein the LCP solver further comprises:

a plurality of Island Processing Engines (IPEs), each IPE receiving an island data set and further comprises a portion of the plurality of ~~parallel~~ execution units;

wherein each one of the plurality of execution units resolves a data portion derived from the island data set.

14. (Original): The system of claim 13, wherein at least one of the plurality of execution units comprises a vector processor.

15. (Original): The system of claim 13 wherein each IPE further comprises:

an IPE memory storing the island data set;

an Island Control Unit (ICU) logically controlling the transfer of data from the IPE memory to the plurality of execution units.

16. (Original): The system of claim 15 wherein each execution unit further comprises an associated memory storing a respective data portion.

17. (Currently Amended): The system of claim 16 wherein each IPE further comprises:

a Content Addressable Memory (CAM) operatively connected to the ICU and configured to store common object information for the constraint rows in order to identify independent constraint rows of the island data set that do not include a competing object pair[[],] such that, by inter-operation of the ICU and CAM, each respective data portion is derived from the island data set.

18. (Original): The system of claim 15 wherein the PPU further comprises:

a PPU Control Engine(PCE) controlling overall operation of the PPU; and

a Data Movement Engine (DME) controlling the transfer of data between the main memory and the PPU memory and the transfer of data between the PPU memory and respective IPE memories associated with the plurality of IPEs.

19. (Original): A system of claim 18 wherein the PPU communicates data with at least one of the CPU and main memory via at least one protocol selected from a group of protocols defined by USB, USB2, Firewire, PCI, PCI-X, PCI-Express, and Ethernet.

20. (Original): The system of claim 12, wherein the PPU is implemented as a physically separate co-processor operating in conjunction with the CPU, and the LCP solver further comprises:

a plurality of Vector Processing Units (VPUs) connected in parallel and adapted to perform multiple floating point operations to simultaneously resolve the plurality of LCPs.

21-25 (Cancelled)

26. (New): The LCP solver of claim 1, wherein the second constraint rows are distributed to and resolved by the plurality of execution units after resolving of the first constraint rows is complete.

27. (New): The LCP solver of claim 5, wherein the CAM is addressed using object identifiers corresponding to the first common object, the second common object, and other objects defined in the island data set.

28. (New): The LCP solver of claim 27, wherein a CAM entry for a particular object stores an identifier corresponding to one of the execution units in the plurality of execution units and a count of constraint rows that reference the particular object.

29. (New): The LCP solver of claim 1, wherein the collection of data matrices represent changes to velocities and forces influencing movement of the first common object and the second common object.

30. (New): The LCP solver of claim 29, wherein the plurality of execution units are further configured to perform an integration process to update positions of the first common object and the second common object.